

This Page Is Inserted by IFW Operations  
and is not a part of the Official Record

## **BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

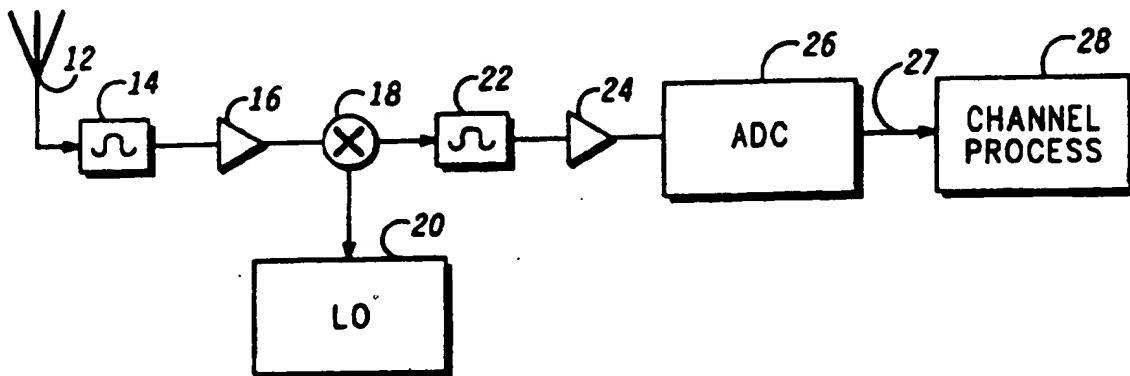
**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning documents *will not* correct images,  
please do not report the images to the  
Image Problem Mailbox.**

## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

|   |  |  |  |
|---|--|--|--|
| (51) International Patent Classification <sup>6</sup> :<br><b>H03M 1/12, H04B 1/26, H04L 5/06</b>   |  | A1   | (11) International Publication Number:<br><b>WO 96/21280</b> |
| (21) International Application Number:<br><b>PCT/US95/15295</b>   |  | (81) Designated States: CA, CN, DE, FI, GB, JP, SE.                            |  |
| (22) International Filing Date: 22 November 1995 (22.11.95)   |  | Published<br><i>With international search report.<br/>With amended claims.</i> |  |
| (30) Priority Data:<br>08/366,347 29 December 1994 (29.12.94) US  |  |  |  |
| (71) Applicant: MOTOROLA INC. [US/US]; 1303 East Algonquin Road, Schaumburg, IL 60196 (US).   |  |  |  |
| (72) Inventors: SMITH, Paul, Fielding; 7325 Stonedale Court, North Richland Hills, TX 76180 (US). PINCKLEY, Danny, Thomas; 3714 Dauphine Court, Arlington, TX 76016 (US). |  |  |  |
| (74) Agents: WARREN, Raymond, J. et al.; Motorola Inc., Intellectual Property Dept., 1303 East Algonquin Road, Schaumburg, IL 60196 (US).                                 |  |  |  |

(54) Title: SPLIT FREQUENCY BAND SIGNAL DIGITIZER AND METHOD

10

## (57) Abstract

A split frequency band signal digitizer (10) includes a first mixer (18) for translating a split-band signal (200) about a multiple of the sampling frequency. The split-band signal so translated is then communicated to an analog-to-digital converter (26). The digitized signal is then analyzed to recover an original portion of the split-band signal and a second portion of the signal aliased into a single Nyquist band.

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

|    |                          |    |  |    |                          |
|----|--------------------------|----|--|----|--------------------------|
| AM | Armenia                  | GB | United Kingdom                           | MW | Malawi                   |
| AT | Austria                  | GE | Georgia                                  | MX | Mexico                   |
| AU | Australia                | GN | Guinea                                   | NE | Niger                    |
| BB | Barbados                 | GR | Greece                                   | NL | Netherlands              |
| BE | Belgium                  | HU | Hungary                                  | NO | Norway                   |
| BF | Burkina Faso             | IE | Ireland                                  | NZ | New Zealand              |
| BG | Bulgaria                 | IT | Italy                                    | PL | Poland                   |
| BJ | Benin                    | JP | Japan                                    | PT | Portugal                 |
| BR | Brazil                   | KE | Kenya                                    | RO | Romania                  |
| BY | Belarus                  | KG | Kyrgyzstan                               | RU | Russian Federation       |
| CA | Canada                   | KP | Democratic People's Republic<br>of Korea | SD | Sudan                    |
| CF | Central African Republic | KR | Republic of Korea                        | SE | Sweden                   |
| CG | Congo                    | KZ | Kazakhstan                               | SG | Singapore                |
| CH | Switzerland              | LI | Liechtenstein                            | SI | Slovenia                 |
| CI | Côte d'Ivoire            | LK | Sri Lanka                                | SK | Slovakia                 |
| CM | Cameroon                 | LR | Liberia                                  | SN | Senegal                  |
| CN | China                    | LT | Lithuania                                | SZ | Swaziland                |
| CS | Czechoslovakia           | LU | Luxembourg                               | TD | Chad                     |
| CZ | Czech Republic           | LV | Latvia                                   | TG | Togo                     |
| DE | Germany                  | MC | Monaco                                   | TJ | Tajikistan               |
| DK | Denmark                  | MD | Republic of Moldova                      | TT | Trinidad and Tobago      |
| EE | Estonia                  | MG | Madagascar                               | UA | Ukraine                  |
| ES | Spain                    | ML | Mali                                     | UG | Uganda                   |
| FI | Finland                  | MN | Mongolia                                 | US | United States of America |
| FR | France                   | MR | Mauritania                               | UZ | Uzbekistan               |
| GA | Gabon                    |    |  | VN | Viet Nam                 |

## SPLIT FREQUENCY BAND SIGNAL DIGITIZER AND METHOD

### Field of the Invention

5       The present invention relates to multi-channel digital transceivers, and more particularly, to a split frequency band signal digitizer and a method of efficiently digitizing split frequency band signals.

10                              Background of the Invention

There are numerous advantages to implementing a radio communication system using digital techniques. Notably, there is enhanced system capacity, reduced noise, and reduced hardware and associated power consumption. There has been proposed several digital radio communication systems. For example, there is shown and described in the commonly assigned U.S. Patent Application entitled "Multi-Channel Digital Transceiver and Method" filed on even date herewith and of which the Applicants are co-inventors 15       several preferred embodiments of radio communication systems 20       implementing digital techniques.

Fundamental to the digital radio communication system is the requirement that the received analog radio signal be digitized. The well known Nyquist criteria provides that such digitization is 25       accomplished with minimal error using an analog-to-digital converter (ADC) with a sampling rate greater than twice the bandwidth of the analog signal. In United States Patent No. 5,251,218 a methodology typical of the prior art is disclosed for digitizing an analog radio frequency signal. It will be appreciated, 30       however, where the radio signal occupies a large bandwidth, ADCs

capable of operation at very high sampling rates are required. Such devices, to the extent they are available, are expensive and often suffer reduced performance, i.e., have significant distortion and increased power consumption when operated at high sampling rates.

5       The spectrum allocated to radio communication systems is typically large with respect to the requirements for digitizing. In some radio communication systems, however, although the desired signal occupies a large bandwidth, not all of the bandwidth is occupied by signals of interest. In cellular radio telephone  
10      systems, for example, the communication bandwidth is not contiguous. When radio spectrum was initially allocated for cellular radio telephone communications, two contiguous 10 Megahertz (MHz) blocks of spectrum were allocated for "A-band" operators and "B-band" operators, respectively. However, as the  
15      need arose to enhance capacity of the cellular radio communication system, additional bandwidth was required. Unfortunately, large enough blocks of bandwidth adjacent the originally allocated blocks were not available. Hence, additional 2.5 MHz blocks of bandwidth were allocated. The resulting A-band is illustrated in FIG. 2A as an  
20      11 MHz block and a 1.5 MHz block separated by a 10 MHz block occupied by the B-band. So, while the cellular A-band and B-band each have a bandwidth of 12.5 MHz, spectrally, the entire A-band covers 22.5 MHz of bandwidth in two discontinuous portions.

25      In order to digitize the A-band, for example, one would need an ADC capable of operating, according to Nyquist criteria, at least at 45 Mhz or 45 million samples per second (Ms/s), and more reliably at 56Ms/s. Splitting the signal into smaller segments allows the use of multiple ADCs at lower sampling rates. Using multiple ADCs has the disadvantage of requiring more hardware. Furthermore, clock  
30      frequency and higher order harmonics thereof inevitably fall into the frequency band of the signal being digitized. Still another

disadvantage is the amount of digital data handling required to filter, interpolate, compensate for band overlap and sum the resulting multiple digital signals.

Therefore, there is a need for a device and method for  
5 digitizing split frequency band signals which does not require high sampling rates, and does not significantly increase the amount of hardware required for the communication system. Such a device and method are provided by the present invention, and one of ordinary skill in the art will readily appreciate the many advantages and  
10 features of the present invention from the following detailed description and accompanying drawings.

#### Brief Description of the Drawings

15 FIG. 1 is a block diagram representation of a split frequency band digitizer in accordance with a preferred embodiment of the present invention;

FIG. 2A is a spectral representation of a split frequency band signal;

20 FIG 2B is a spectral representation of the split frequency band signal shown in FIG. 2A after translation according to a preferred embodiment of the present invention;

25 FIG 2C is a spectral representation of the split frequency band signal shown in FIG. 2B after converting to a digital signal in accordance with a preferred embodiment of the present invention; and

FIG 3 is a flowchart illustrating a method of digitizing a split frequency band signal in accordance with a preferred embodiment of the present invention.

### Detailed Description of a Preferred Embodiment

Digitizing of a split frequency band analog signal is accomplished in the present invention with both reduced sampling frequency and hardware requirements. The present invention provides for mixing the entire split frequency bandwidth about a reference frequency which will allow for digitizing at a reduced sampling frequency. The reference frequency is chosen such that the segments of the split frequency bandwidth occupy adjacent aliasing bands. Digitizing at a reduced sampling frequency produces a digital signal with the entire split frequency band signal represented in a single Nyquist band of the sampling frequency.

Referring to FIG. 1 a digital radio receiver 10 incorporating the digitizer of the present invention is shown. A split frequency band analog signal is received at antenna 12 and down mixed and signal conditioned through filter 14 and amplifier 16 as is well known in the art. The split frequency band signal is then communicated to mixer 18 where it is frequency translated by a signal from local oscillator 20.

With reference to FIGs. 2A - 2C, a split frequency band signal 200 is shown. Signal 200 is typical of that of the cellular A-band, however, it should be understood that the present invention is applicable to digitizing any type split frequency band analog signal. The result of mixing signal 200 with the reference frequency in mixer 18 is signal 200', FIG. 2B. As can be seen, after mixing, the split frequency band signal is translated such that the split segments of the signal 200' lie about the reference frequency shown as  $f_s/2$ . It will be appreciated that an appropriate local oscillator frequency can be selected for either high side or low side injection, depending upon the split band frequency signal, to translate the signal about the reference signal.

The mixed split frequency band signal is further conditioned through filter 22 and amplifier 24. The translated split band frequency signal is then communicated to analog-to-digital converter (ADC) 26. Analog-to-digital converter 26, digitizes at a sampling rate  $f_s$ , in a known manner, the split frequency band analog signal to produce a digital signal 27. Digital signal 27 is represented in FIG. 2C as 200". As can be seen from FIG. 2C, digitizing signal 200' results in aliasing of the split band segments (shown in phantom) of signal 200', with the aliased segments contained within a Nyquist 5 band of the sampling frequency,  $f_s$ .

In the preferred embodiment of the present invention, the sampling frequency,  $f_s$ , is selected to be approximately 2.5 times the bandwidth of the wider segment of the split band frequency signal. The reference frequency is selected to be approximately half the 15 sampling frequency or a multiple thereof. As will be appreciated, the entire split frequency band signal is digitized using a sampling rate which is less than twice the total spectral bandwidth of the split frequency band signal, e.g., as shown in FIG. 2A. With further reference to FIG. 2C a specific example of selecting the sampling 20 frequency is shown for the cellular A-band. From the spectral chart shown, two observations can be made, first:

$$X + 1.5 + 2Y = 10 \quad (a)$$

and second:

$$Z + 11 + X + 1.5 + Y = f_s/2 \quad (b)$$

25 from which it can be determined that:

$$f_s = 33.5 + X + 2Z \quad (c)$$

where X, Y and Z are as shown in FIG. 2C, and 11 MHz and 1.5 MHz are the bandwidths of the segments being digitized, respectively.

This relationship is true regardless of the alias band being considered. It can be seen from the above that  $f_s$  can approach 33.5 Ms/s as compared to 56 Ms/s which would otherwise be required to digitized the cellular A-band. In practical

5 applications,  $f_s$  is dependent on filtering. That is, the X segment must be wide enough to allow an anti-aliasing filter to pass the 11 MHz band but attenuate the 1.5 MHz alias. The Z segment must be big enough such that, after mixing, the image that is generated by sampling can be filtered out. In practice,  $f_s$  can realistically  
10 approach 35 Ms/s.

The digital signal 200" is then communicated to channel processors 28. Channel processors operate on signal 200" to recover the digital representation of the entire split frequency band signal. A discussion of such channel processors can be found in the aforementioned U.S. Patent Application entitled "Multi-channel Digital Transceiver and Method". It should be noted that the digital representation of the signal, due to aliasing contains transposed segments of the split frequency band signal. It would, however, be within the skilled artisans knowledge to properly reconstruct the split frequency band signal from these transposed segments.  
15  
20

With reference then to FIG. 3, a method of digitizing a split frequency band signal in accordance with a preferred embodiment of the present invention is shown, 300-308. A split frequency band signal is received, 302, and is mixed 304 such that the translated split frequency band signal segments lie about a reference frequency. The mixed signal is then digitized, 306, producing a digital signal including aliases of the split frequency band signal. The mixed signal is digitized a sampling rate which is less than twice the total bandwidth of the split frequency band signal. The split frequency band signal is then recovered from the digital signal in a channel processor card 308.  
25  
30

As one of ordinary skill the art will appreciate from the foregoing discussion, the present invention provides a digitizer and method which reduces sampling frequency and/or hardware requirements for digitizing a split frequency band signal. The many features, advantages and fair scope of the present invention is readily discerned from the foregoing discussion and the subjoined claims.

5 What is claimed is:

## Claims

## 1. A split frequency signal digitizer comprising:

5            a first frequency translator coupled to receive an analog split frequency band signal, the analog split frequency band signal including a first segment having a first bandwidth and a second segment having a second bandwidth, the analog split frequency band signal having a total bandwidth greater than the sum of the first and second bandwidths, the frequency translator producing a frequency translated signal from the received signal;

10            15            an analog-to-digital converter responsive to the frequency translator, the analog-to-digital converter digitizing the frequency translated signal by sampling the frequency translated signal at a sampling rate less than twice the total bandwidth of the split frequency band signal to produce a digital signal, the digital signal including a digitized version of the first and second segments and aliased versions of the first and second segments.

20            2. The split frequency signal digitizer as in claim 1 further comprising a processor recovering a digital representation of the analog split frequency band signal from the digital signal.

25            3. The split frequency signal digitizer as in claim 1 wherein the first and second segments and at least one of the aliased versions of the first and second segments are all spectrally located within a bandwidth that is less than twice the total bandwidth of the analog split frequency band signal.

30            4. The split frequency signal digitizer as in claim 1 further comprising analysis means responsive to the analog-to-digital

converter for receiving the digital signal and extracting a digital representation of the analog split frequency band signal.

5        5. A method of digitizing an analog split frequency band signal comprising the steps of:

receiving an analog split frequency band signal, the analog split frequency band signal having a first segment with a first bandwidth, a second segment with a second bandwidth, and a total bandwidth greater than the sum of the first and second bandwidths;

10        frequency translating the received signal to produce a frequency translated signal, such that a reference frequency is located between frequencies associated with frequency translated versions of the first segment and the second segment in the frequency translated signal; and

15        digitizing the frequency translated signal by sampling the frequency translated signal at a sampling rate less than twice the total bandwidth of the analog split frequency band signal to produce a digital signal, the digital signal including a digital representation of the first and second segments and aliased versions of the first and second segments.

20        25        6. The method of digitizing an analog split frequency band signal as in claim 5 wherein the digital representation of the first and second segments and at least one of the aliased versions of the first and second segments are located within a bandwidth that is less than twice the total bandwidth of the split frequency band signal.

7. The method of digitizing an analog split frequency band signal as in claim 5 wherein the reference frequency is about one half of the sampling rate.

5

8. The method of digitizing an analog split frequency band signal as in claim 7 wherein at least one of the aliased versions of one of the first and second segments are contained within a Nyquist band based on the sampling rate.

10

9. The method of digitizing an analog split frequency band signal as in claim 5 wherein the step of frequency translating the analog split frequency band signal comprises translating the analog split frequency band signal about an integer multiple of a Nyquist frequency of the analog split frequency band signal.

15

10. A digital receiver comprising:

a receiver detecting an analog split frequency signal including a first segment having a first bandwidth and a second segment having a second bandwidth, the analog split frequency signal having a total bandwidth greater than the sum of the first and second bandwidths; and

an analog-to-digital converter responsive to the receiver, the analog-to-digital converter digitizing the analog split frequency signal by sampling the analog split frequency signal at a sampling rate less than twice the total bandwidth of the analog split frequency signal to produce a digital signal, the digital signal including a digitized version of the first and second segments and aliased versions of the first and second segments.

20

25

## AMENDED CLAIMS

[received by the International Bureau on 6 May 1996 (06.05.96);  
original claim 1 amended; remaining claims unchanged (3 pages)]

1. A split frequency signal digitizer comprising:
  - a first frequency translator coupled to receive an analog split frequency band signal, the analog split frequency band signal including a first segment having a first bandwidth and a second segment having a second bandwidth, the analog split frequency band signal having a total bandwidth greater than the sum of the first and second bandwidths, the frequency translator producing a frequency translated signal from the received signal, the frequency translated signal having substantially the same total bandwidth as the total bandwidth of the analog split frequency band signal;
  - an analog-to-digital converter responsive to the frequency translator, the analog-to-digital converter digitizing the frequency translated signal by sampling the frequency translated signal at a sampling rate less than twice the total bandwidth of the split frequency band signal to produce a digital signal, the digital signal including a digitized version of the first and second segments and aliased versions of the first and second segments.
2. The split frequency signal digitizer as in claim 1 further comprising a processor recovering a digital representation of the analog split frequency band signal from the digital signal.
3. The split frequency signal digitizer as in claim 1 wherein the first and second segments and at least one of the aliased versions of the first and second segments are all spectrally located within a bandwidth that is less than twice the total bandwidth of the analog split frequency band signal.

4. The split frequency signal digitizer as in claim 1 further comprising analysis means responsive to the analog-to-digital converter for receiving the digital signal and extracting a digital representation of the analog split frequency band signal.

5

5. A method of digitizing an analog split frequency band signal comprising the steps of:

10 receiving an analog split frequency band signal, the analog split frequency band signal having a first segment with a first bandwidth, a second segment with a second bandwidth, and a total bandwidth greater than the sum of the first and second bandwidths;

15 frequency translating the received signal to produce a frequency translated signal, such that a reference frequency is located between frequencies associated with frequency translated versions of the first segment and the second segment in the frequency translated signal; and

20 digitizing the frequency translated signal by sampling the frequency translated signal at a sampling rate less than twice the total bandwidth of the analog split frequency band signal to produce a digital signal, the digital signal including a digital representation of the first and second segments and aliased versions of the first and second segments.

25

6. The method of digitizing an analog split frequency band signal as in claim 5 wherein the digital representation of the first and second segments and at least one of the aliased versions of the first and second segments are located within a bandwidth that is less than twice the total bandwidth of the split frequency band signal.

7. The method of digitizing an analog split frequency band signal as in claim 5 wherein the reference frequency is about one half of the sampling rate.

5

8. The method of digitizing an analog split frequency band signal as in claim 7 wherein at least one of the aliased versions of one of the first and second segments are contained within a Nyquist band based on the sampling rate.

10

9. The method of digitizing an analog split frequency band signal as in claim 5 wherein the step of frequency translating the analog split frequency band signal comprises translating the analog split frequency band signal about an integer multiple of a Nyquist frequency of the analog split frequency band signal.

15

10. A digital receiver comprising:

a receiver detecting an analog split frequency signal including a first segment having a first bandwidth and a second 20 segment having a second bandwidth, the analog split frequency signal having a total bandwidth greater than the sum of the first and second bandwidths; and

an analog-to-digital converter responsive to the receiver, the analog-to-digital converter digitizing the analog 25 split frequency signal by sampling the analog split frequency signal at a sampling rate less than twice the total bandwidth of the analog split frequency signal to produce a digital signal, the digital signal including a digitized version of the first and second segments and aliased versions of the first and second segments.

1 / 2

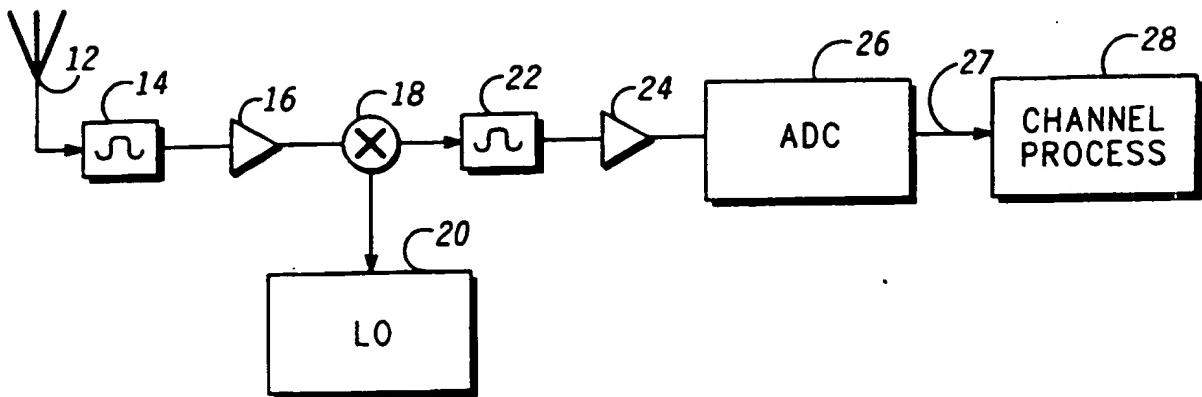
10

FIG. 1

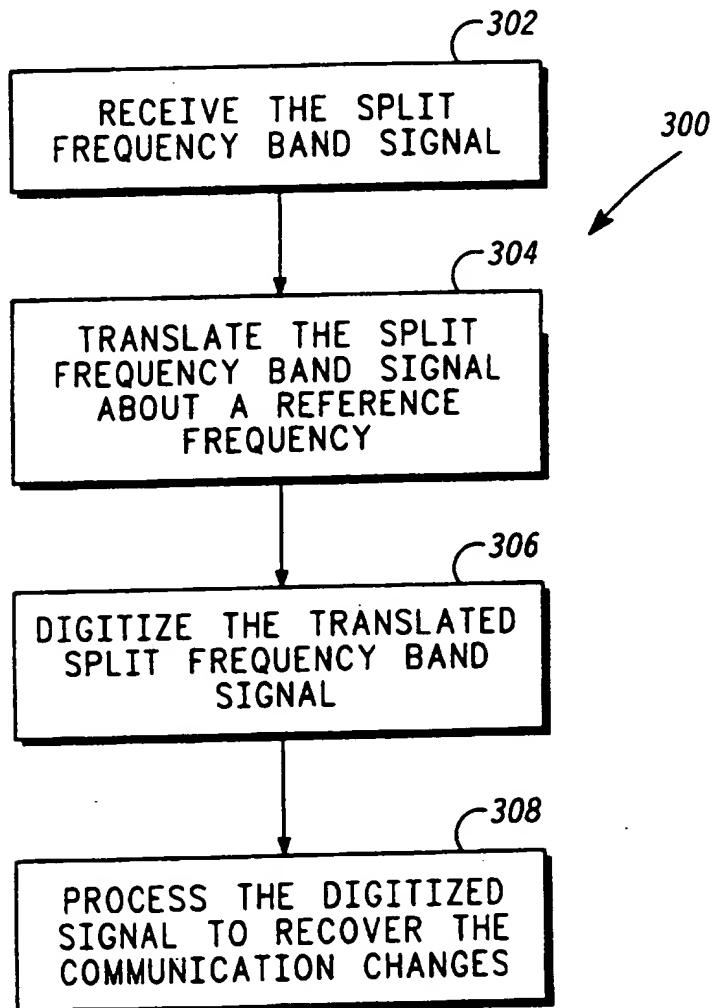


FIG. 3

2 / 2

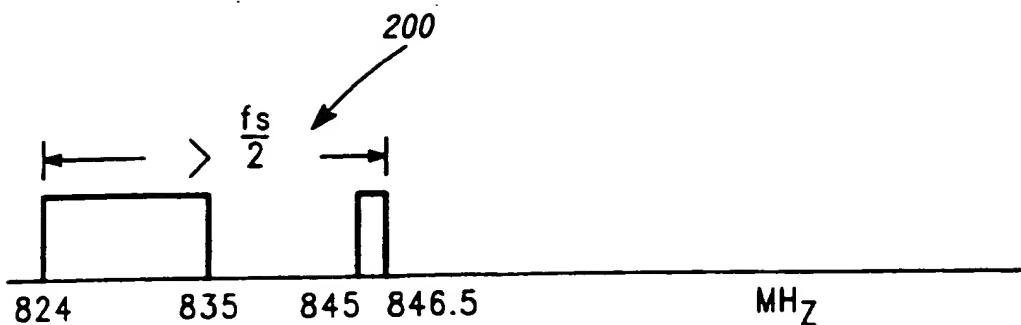


FIG. 2A

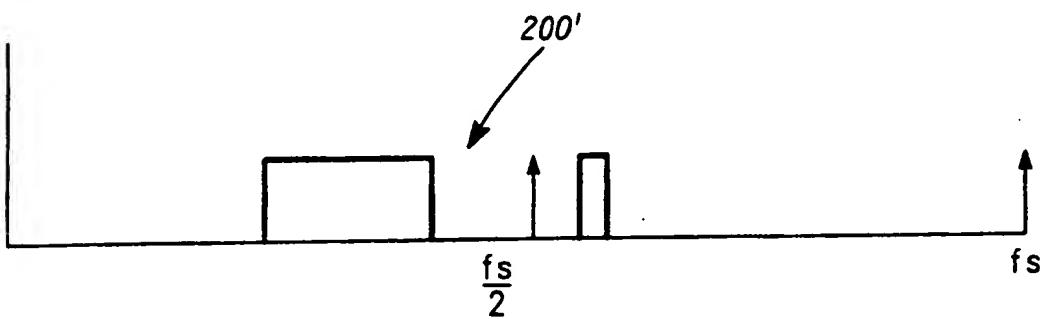


FIG. 2B

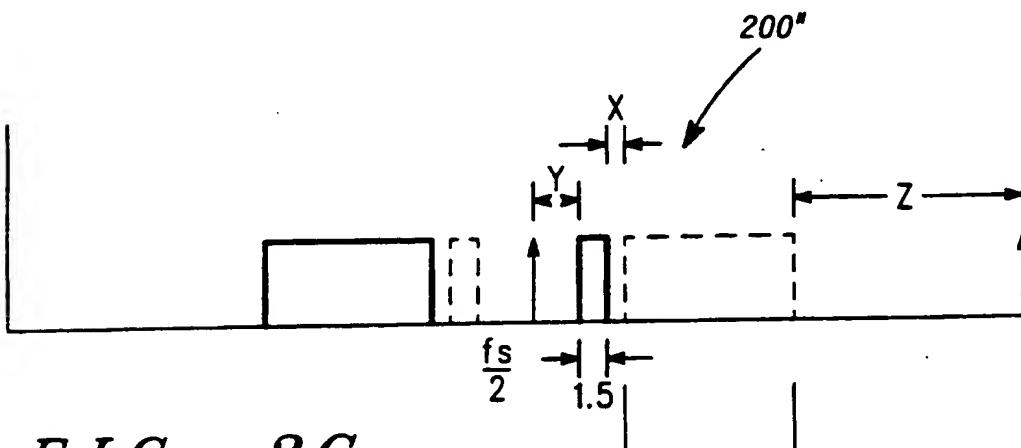


FIG. 2C

## INTERNATIONAL SEARCH REPORT

International Application No.

PCT/US95/15295

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(6) :H03M 1/12; H04B 1/26; H04L 5/06

US CL :375/316; 455/313; 341/155

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

U.S.: 375/316; 455/313, 131; 341/155

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Please See Extra Sheet.

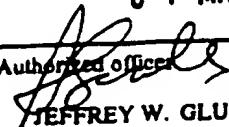
**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                           | Relevant to claim No.   |
|-----------|--|-------------------------|
| X<br>---- | US, A, 5,280,636 (KELLEY ET AL) 18 January 1994, entire document, especially figs. 1 and 3, cols. 2-3 and 6. | 1-4, 10<br>-----<br>5-9 |
| A         | US, A, 5,410,569 (HALOZAN) 25 April 1995, fig. 1A.   | 1-10                    |
| A, P      | US, A, 5,387,913 (PARK ET AL) 07 February 1995, abstract and fig. 1.   | 1-10                    |
| A         | US, A, 3,609,555 (VAN BLERKOM ET AL) 28 September 1971, fig. 1.  | 1-10                    |
| A         | EP, A, 0 529 183 (BLAUPUNKT-WERKE GMBH) 03 March 1993, entire document.                                      | 1-10                    |

 Further documents are listed in the continuation of Box C. See patent family annex.

- \* Special categories of cited documents:
- \*A\* document defining the general state of the art which is not considered to be part of particular relevance
- \*E\* earlier document published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- \*&\* document member of the same patent family

Date of the actual completion of the international search  
**06 FEBRUARY 1996**Date of mailing of the international search report  
**04 MAR 1996**Name and mailing address of the ISA/US  
Commissioner of Patents and Trademarks  
Box PCT  
Washington, D.C. 20231Authorized officer  
  
**JEFFREY W. GLUCK**

Facsimile No. (703) 305-3230

Telephone No. (703) 308-5462

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US95/15295

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages      | Relevant to claim No. |
|-----------|---|-----------------------|
| A         | US, A, 5,251,218 (STONE ET AL) 05 October 1993, entire document, especially, figs. 4-6. | 1-10                  |

INTERNATIONAL SEARCH REPORT

International Application No.  
PCT/US95/15295

B. FIELDS SEARCHED

Electronic data bases consulted (Name of data base and where practicable terms used):

APS

search terms: receiver, split or multiple bands, analog to digital conversion, digitizer, quantizer, frequency translation, mixing, heterodyning, downconversion, aliasing

# UK Patent Application (19) GB (11) 2 301 500 (13) A

(43) Date of Printing by UK Office 04.12.1996

(21) Application No 9617717.5

(22) Date of Filing 22.11.1995

(30) Priority Data

(31) 08366347

(32) 29.12.1994

(33) US

(86) International Application Data  
PCT/US95/15295 En 22.11.1995

(87) International Publication Data  
WO96/21280 En 11.07.1996

(51) INT CL<sup>6</sup>

H03M 1/12, H04B 1/26, H04L 5/06

(52) UK CL (Edition O)

H3H HAU

U1S S2205 S2215

(56) Documents Cited by ISA

EP 0529183 A1 US 5410569 A US 5387913 A  
US 5280636 A US 5251218 A US 3609555 A

(58) Field of Search by ISA

U S Classification: 375/316; 455/313, 131; 341/155;  
Online

(71) Applicant(s)

Motorola Inc

(Incorporated in USA - Delaware)

1303 East Algonquin Road, Schaumburg,  
Illinois 60196, United States of America

(74) Agent and/or Address for Service

Sarah J Spaulding

Motorola Limited, European Intellectual Property  
Operation, Midpoint, Alencon Link, BASINGSTOKE,  
Hampshire, RG21 7PL, United Kingdom

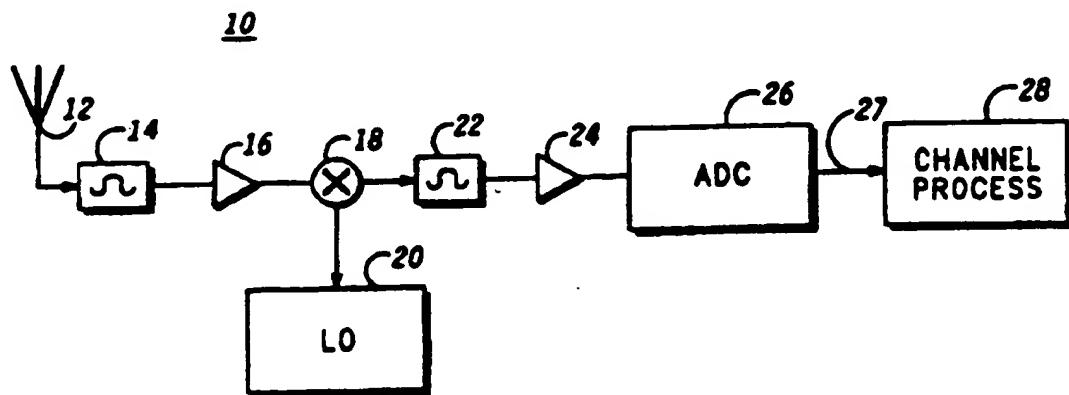
(72) Inventor(s)

Paul Fielding Smith

Danny Thomas Pinckley

## (54) Split frequency band signal digitizer and method

(57) A split frequency band signal digitizer (10) includes a first mixer (18) for translating a split-band signal (200) about a multiple of the sampling frequency. The split-band signal so translated is then communicated to an analog-to-digital converter (26). The digitized signal is then analyzed to recover an original portion of the split-band signal and a second portion of the signal aliased into a single Nyquist band.



GB 2 301 500 A